SITE INSPECTION REPORT
UPPER MOUNTAIN ROAD
738 UPPER MOUNTAIN ROAD
LEWISTON, NIAGARA COUNTY, NEW YORK

EPA ID No.: NYN000206697

EPA Contract No.: EP-S5-06-04
TDD No.: S05-0013-1307-007
Document Control No.: 2224-2A-BKYQ

June 2014

Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Prepared by:

Weston Solutions, Inc.
Edison, New Jersey 08837

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SUBMITTED BY:

Date 6/9/2014

Denise Breen
Assistant Project Scientist

Date 6/9/2014

Gerald V. Gilliland, P.G
Senior Technical Manager

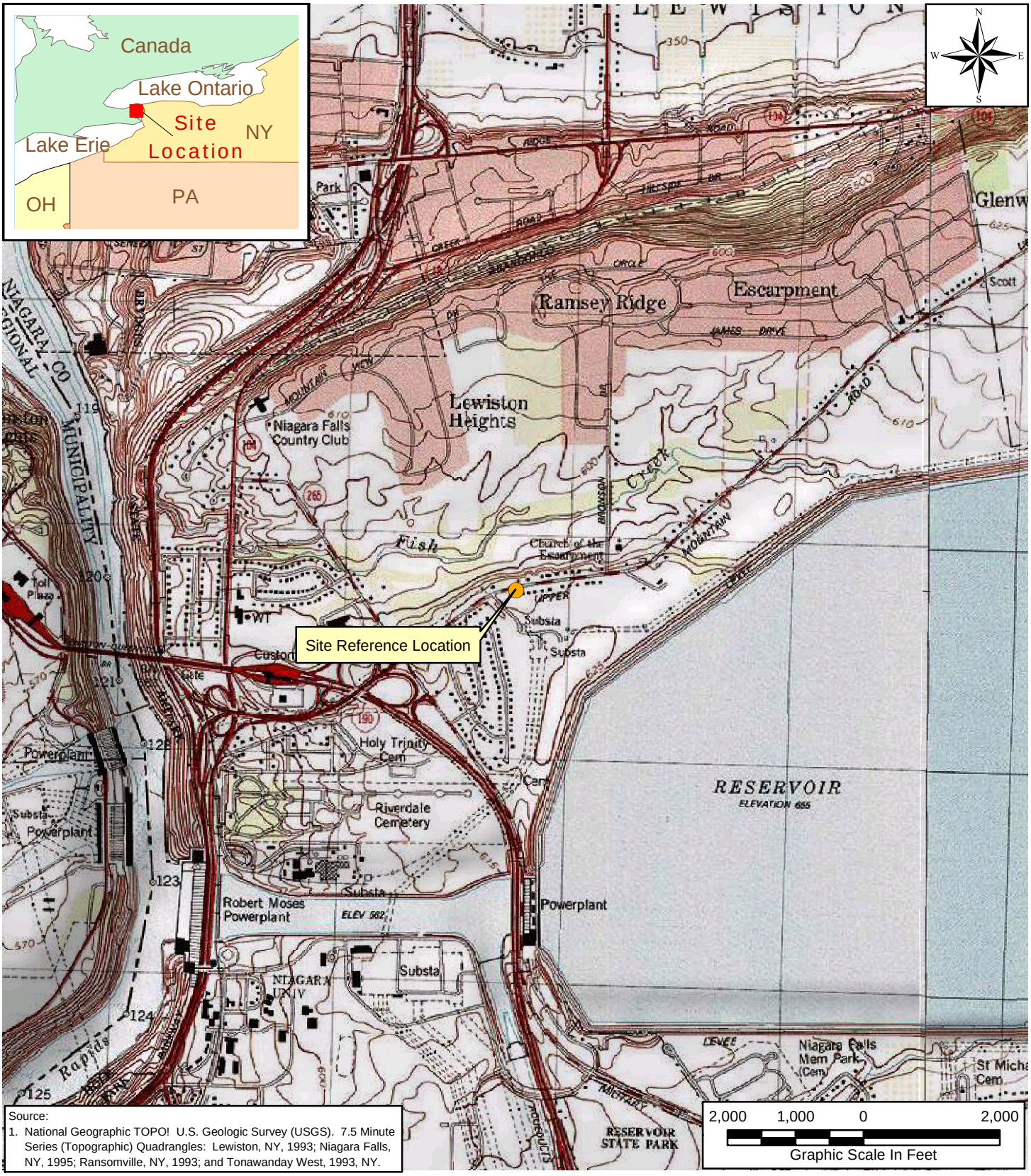
SITE SUMMARY

The Upper Mountain Road (UMR) site (EPA ID No. NYN000206697) consists of a small area of radionuclide contamination located at geographic coordinates 43.15553, -79.02245 (tax parcel 115.08-1-27) in Lewiston, NY [Ref. 2, Figure 1 and 2; 4, pp. 8–10; 5, pp. 1–3; 10, p. 2]. The area of observed contamination is approximately 1,493 square feet (ft^2) and is located on the vacant parcel 115.08-1-27, which is owned by Talarico Bros. Building Corp (TBBC) and covers approximately 10.2 acres [Ref. 2, Figure 2, 3 and 4; 4, pp. 8–10; 32, pp. 1–3]. The area of observed contamination is located at the entrance of the driveway that is currently utilized by the 738 Upper Mountain Road residence, although was historically used as an access road to the vacant property owned by TBBC [Ref. 2, Figure 3 and 4; 4, pp. 8–10; 32, pp. 1–3]. The residence is on a separate property from the area of contamination [Ref. 2, Figure 2 and 4].

The UMR site is bordered to the north by Upper Mountain Road, residential properties, and a further wooded area; to the east and west by residential properties; and to the south by a wooded area [Ref. 2, Figure 2; 10, p. 3]. A Site Location Map and Site Map are included as Figures 1 and 2 of this report.

In July 1985, members of the Radiological Survey Activities (RASA) group at Oak Ridge National Laboratory (ORNL) performed the radiological survey of 738 Upper Mountain Road, which documented a maximum gamma exposure rate of 710 microroentgens per hour (μR/hr) [Ref. 3, pp. 8, 10]. The area with these readings was an area approximately 10 feet wide by 59 feet in length along a ditch and gravel residential driveway [Ref. 3, p. 16]. The survey showed that the 738 Upper Mountain Road anomaly is associated with the asphalt driveway that contained a phosphate slag material [Ref. 3, p. 8]. This rocky-slag waste material was used for bedding under asphalt surfaces and in general gravel applications at the UMR site and 61 other locations in the Niagara Falls area identified by ORNL [Ref. 3, p. 8]. Biased surface soil samples collected in conjunction with the study indicated the presence of radium-226 (Ra-226), uranium-238 (U-238), and thorium-232 (Th-232) at the UMR site [Ref. 3, p. 34]. The subsequent November 1986 report stated that all the contaminated soil and rock samples collected had approximately equal concentrations of Ra-226 and U-238, which suggested to the investigators that the rocks probably originated from a singular source [Ref. 3, p. 14]. The origin of the thorium-bearing material was unknown; the report postulated that its source was from some type of mineral extraction activity in the Niagara Falls area [Ref. 3, p. 19]. The report stated that the 738 Upper Mountain Road anomaly was not related to materials connected with Niagara Falls Storage Site (NFSS), including materials that were transported to NFSS [Ref. 3, pp. 9, 14].

During a reconnaissance performed by the New York State Department of Health (NYSDOH) and New York State Department of Environmental Conservation (NYSDEC) on July 9, 2013, screening activities showed radiation levels at 300 μR/hr with a hand-held pressurized ion chamber (PIC) and 105,000-110,000 counts per minute (CPM) with a sodium iodide (NaI) 2x2 scintillation detector; the singular reading was taken at the end of the driveway adjacent to Upper Mountain Road [Ref. 11, pp. 1, 4].



Source:
1. National Geographic TOPO! U.S. Geologic Survey (USGS). 7.5 Minute Series (Topographic) Quadrangles: Lewiston, NY, 1993; Niagara Falls, NY, 1995; Ransomville, NY, 1993; and Tonawanday West, 1993, NY.

LEGEND:

Site Reference Location

TITLE:

Site Location Map
Upper Mountain Road
Lewiston, NY

PROJECT:
Upper Mountain Road

CLIENT NAME:
EPA

WESTON SOLUTIONS

DATE:
June 2014

FIGURE #:
1

P:\SAT2\2013 NY RAD Sites\738_Upper_Mountain_Road\MXD\14329_UMR_SI_Topo.mxd

Sources:
1. NYS Division of Homeland Security and Emergency Services - Office of Cyber Security. Niagara County 12 Inch Ortho (4bd). http://www.orthos.dhses.ny.gov/?id=974130. November 2011.
2. NYS Division of Homeland Security and Emergency Services - Office of Cyber Security. Erie County 12 Inch Ortho (4bd). http://www.orthos.dhses.ny.gov/?id=974130. November 2011.

LEGEND:

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Site Map
Upper Mountain Road
Lewiston, NY

PROJECT:
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CLIENT NAME:
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WESTON SOLUTIONS

DATE:
June 2014

FIGURE #:
2

P:\SAT2\2013 NY RAD Sites\738_Upper_Mountain_Road\MXD\14330_UMR_SI_Aerial.mxd

On December 12, 2013, Weston Solutions, Inc. (WESTON®) personnel collected a total of nine soil samples (including one environmental duplicate sample) and two slag samples from the Upper Mountain Road site [Ref. 2, Figure 4; 12, p. 3]. Soil samples were also collected from two locations suspected to be outside the influence of the area of observed contamination to document background conditions [Ref. 2, Figure 4; 12, p. 3]. At each sample location, soil samples were collected directly beneath slag material; at locations where a radioactive layer was not present, the soil sample was collected at the equivalent depth interval [Ref. 2, Figure 4; 12, p. 3]. The slag samples consisted of pulverized silty sand with rocks, cobbles, and gravel (i.e., radioactive waste material mixture) rather than singular pieces of slag [Ref. 12, p. 3].

The soil, slag, and aqueous rinsate blank samples were analyzed by Test America Laboratories for Target Analyte List (TAL) metals analyses, including mercury; isotopic thorium (IsoTh), isotopic uranium (IsoU), Radium-226, and Radium-228 by alpha spectroscopy; and radioisotopes by gamma spectroscopy [Ref. 12, p. 3]. One soil sample for TAL metals analyses was designated as a Matrix Spike/Matrix Spike Duplicate (MS/MSD) sample for Quality Assurance/Quality Control (QA/QC) purposes [Ref. 12, p. 3]. One rinsate blank was collected to demonstrate adequate decontamination of non-dedicated sampling equipment (i.e., cutting shoe) [Ref. 12, p. 3]. All samples were shipped via Federal Express to Test America Laboratories for analysis [Ref. 12, pp. 2, 13–16]. Analytical results indicate concentrations of radionuclides found in the slag and soil to be significantly higher than at background conditions [Ref. 30, pp. 21–24; 31, pp. 1–2].

On May 1 and 2, 2014, WESTON personnel collected radon and thoron concentration measurements from locations on and in the vicinity of the UMR site [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. At the selected locations in background areas, above the source material, and off the source area, radon and thoron concentration measurements in picocuries per liter (pCi/L) were collected with RAD7 radon detectors [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. The radon and thoron measurements were collected at heights of one meter above the ground surface [Ref. 4, pp. 14-19, 29-30; 34, pp. 2-5]. During the May 2014 air monitoring event, background radon concentrations were measured as 0.16 +/- 0.13 pCi/L (to account for maximum background concentrations, the uncertainty value is added to the background measurement for an adjusted concentration of 0.29 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.070 pCi/L (adjusted concentration is 0.12 pCi/L) during the afternoon hours on May 1, 2014 [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. Background thoron concentrations were calculated to be 0.00 +/- 0.060 pCi/L (adjusted concentration is 0.060 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.10 pCi/L (adjusted concentration is 0.15 pCi/L) during the afternoon hours on May 1, 2014 [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. To account for minimum possible release concentrations, the uncertainty value for each potential release measurement collected above and downwind of source areas is subtracted from the measurement to calculate the adjusted concentration [Ref. 34, pp. 2-5, 9, 11]. There were no radon or thoron concentrations that exceeded the site-specific background, nor were there any adjusted concentrations that equaled or exceeded a value two standard deviations above the mean site-specific background concentration for that radionuclide in that type of sample [Ref. 2, Figure 9; 34, pp. 2-5, 9, 11].

P:/SAT2/2013 NY RAD Sites/738_Upper_Mountain_Road/MXD/14402_UMR_SI_Sample_Loc_W_Results.mxd

Upper Mountain Road

SLAG
SG02 (0.0-1.0 ftbgs)

Uranium-238	26.7	pCi/g
Thorium-230	21.8	pCi/g
Uranium-233/234	27.0	pCi/g
Radium-226	32.6	pCi/g
Thorium-232	116	pCi/g
Radium-228	165	pCi/g
Thorium-228	119	pCi/g
Uranium-235/236	1.48	pCi/g

SOIL
S01 (1.0-2.0 ftbgs)

Uranium-238	5.86	pCi/g
Thorium-230	4.74	pCi/g
Uranium-233/234	6.87	pCi/g
Radium-226	15.7	pCi/g
Thorium-232	23.9	pCi/g
Radium-228	88.5	pCi/g
Thorium-228	25.1	pCi/g
Uranium-235/236	0.389	pCi/g

SLAG
SG01 (0.0-1.0 ftbgs)

Uranium-238	8.68	pCi/g
Thorium-230	3.69	pCi/g
Uranium-233/234	7.84	pCi/g
Radium-226	9.33	pCi/g
Thorium-232	19.7	pCi/g
Radium-228	52.4	pCi/g
Thorium-228	20.1	pCi/g
Uranium-235/236	0.427	pCi/g

SOIL
S03 (1.0-2.0 ftbgs)

Uranium-238	1.01	pCi/g
Thorium-230	1.09	pCi/g
Uranium-233/234	0.867	pCi/g
Radium-226	1.37	pCi/g
Thorium-232	1.68	pCi/g
Radium-228	2.31	pCi/g
Thorium-228	1.67	pCi/g
Uranium-235/236	0.0683	pCi/g

S10 (Duplicate) (1.0-2.0 ftbgs)

Uranium-238	0.939	pCi/g
Thorium-230	0.990	pCi/g
Uranium-233/234	1.02	pCi/g
Radium-226	1.37	pCi/g
Thorium-232	2.05	pCi/g
Radium-228	4.23	pCi/g
Thorium-228	2.46	pCi/g
Uranium-235/236	0.0411	pCi/g

S04 (1.5-2.5 ftbgs)

Uranium-238	1.40	pCi/g
Thorium-230	1.60	pCi/g
Uranium-233/234	1.30	pCi/g
Radium-226	2.22	pCi/g
Thorium-232	4.31	pCi/g
Radium-228	7.05	pCi/g
Thorium-228	4.54	pCi/g
Uranium-235/236	0.0636	pCi/g

S05 (1.0-2.0 ftbgs)

Uranium-238	0.979	pCi/g
Thorium-230	1.39	pCi/g
Uranium-233/234	1.04	pCi/g
Radium-226	1.21	pCi/g
Thorium-232	1.77	pCi/g
Radium-228	2.54	pCi/g
Thorium-228	2.06	pCi/g
Uranium-235/236	0.0192	pCi/g

S06 (2.0-3.0 ftbgs)

Uranium-238	1.24	pCi/g
Thorium-230	1.43	pCi/g
Uranium-233/234	0.979	pCi/g
Radium-226	1.54	pCi/g
Thorium-232	2.95	pCi/g
Radium-228	2.99	pCi/g
Thorium-228	2.85	pCi/g
Uranium-235/236	0.0603	pCi/g

S07 (1.5-2.5 ftbgs)

Uranium-238	0.835	pCi/g
Thorium-230	0.941	pCi/g
Uranium-233/234	0.765	pCi/g
Radium-226	1.25	pCi/g
Thorium-232	1.02	pCi/g
Radium-228	0.987	pCi/g
Thorium-228	1.13	pCi/g
Uranium-235/236	0.0674	pCi/g

Background
S08 (1.5-2.5 ftbgs)

Uranium-238	0.597	pCi/g
Thorium-230	0.993	pCi/g
Uranium-233/234	0.799	pCi/g
Radium-226	1.05	pCi/g
Thorium-232	0.835	pCi/g
Radium-228	1.54	pCi/g
Thorium-228	1.08	pCi/g
Uranium-235/236	0.0533	pCi/g

Background
S09 (1.5-2.5 ftbgs)

Uranium-238	1.29	pCi/g
Thorium-230	1.16	pCi/g
Uranium-233/234	1.05	pCi/g
Radium-226	1.03	pCi/g
Thorium-232	1.12	pCi/g
Radium-228	1.37	pCi/g
Thorium-228	1.31	pCi/g
Uranium-235/236	0.0677	pCi/g

Legend
- Soil Boring Location
- Slag Sample Location
- Source Boundary
- Approximate Block and Lot Boundaries

NOTES:
1. All sample IDs preceded by "2224-".
2. All results are in picocuries per gram (pCi/g).
3. Sample results highlighted in red indicate a value that meets the criteria for observed contamination, as detailed in Reference 31.
4. All depths are in feet below ground surface (ftbgs).

SOURCES:
1. NYS Division of Homeland Security and Emergency Services - Office of Cyber Security. Niagara County 12 Inch Ortho (4bd). http://www.orthos.dhses.ny.gov/?id=974130. November 2011.
2. NYS Division of Homeland Security and Emergency Services - Office of Cyber Security. Erie County 12 Inch Ortho (4bd). http://www.orthos.dhses.ny.gov/?id=974130. November 2011.
3. WESTON Region 5 Superfund Technical Assessment and Response Team (START). Site Logbook No. 2224-4E-BJCD, 738 Upper Mountain Road; with attached photo documentation. September to December 2013.

LEGEND:
20 10 0 20
Graphic Scale In Feet

PROJECT: Upper Mountain Road

CLIENT NAME: EPA

TITLE:
Sample Location and Data Results Map
Upper Mountain Road
Lewiston, NY

DRAWING NUMBER: 14402

FIGURE #: 4

DRAWN BY: J. Lynes

REVIEWED BY: D. Breen

PROJECT MANAGER: D. Breen

SCALE: 1" = 20'

DATE: June 2014

N W E S

SITE ASSESSMENT REPORT: PRELIMINARY ASSESSMENT/SITE INSPECTION

PART I: SITE INFORMATION

1. Site Name/Alias Upper Mountain Road

   Street Adjacent to 738 Upper Mountain Road

   City Lewiston State New York Zip 14092

2. County Niagara County Code 063 Cong. Dist. 26

3. EPA ID NO. NYN000206697

4. Parcel 115.08-1-27

5. Latitude 43.1555º North Longitude -79.0224º West

   USGS Quad(s) Lewiston, NY-ON

6. Approximate size of site 1,493 square feet

7. Current Owner Talarico Bros. Building Corp. Telephone No. 716-297-6061

   Mailing Address 8675 Lozina Drive

   City Niagara Falls State New York Zip 14304

8. Current Operator Vacant Telephone No. N/A

   Mailing Address 8675 Lozina Drive

   City Niagara Falls State New York Zip 14304

9. Type of Ownership

   X Private ___ Federal ___ State

   ___ County ___ Municipal ___ Unknown ___ Other _____

   Ref. 2, Figures 1, 2, and 3; 5, p. 1–3; 6, pp. 4–12; 10, p. 2; 12, p. 2; 13, p. 1; 14, p. 2; 23, p. 1.

10. Owner/Operator Notification on File

___ RCRA 3010 ___ Date ___ CERCLA 103c Date _____

___ None _X_ Unknown

11. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments

Permits or other permit information were not found for the subject property.

Ref. 8, pp. 13–16.

12. Site Status

__ Active _X_ Inactive __ Unknown

13. Years of Operation: Not applicable – driveway area on vacant land.

Ref. 2, Figure 2; 8, pp. 13–16; 9, pp. 1–2.

14. Identify the types of waste sources (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Sources

Waste Unit No.	**Waste Source Type**	**Facility Name for Unit**
1	Contaminated Soil	N/A

b) Other Areas of Concern

None.

15. Describe the regulatory history of the site, including the scope and objectives of any previous response actions, investigations and litigation by State, Local and Federal agencies (indicate type, affiliation, date of investigations).

- **Oak Ridge National Laboratory (ORNL) On-Site Survey, November, 1986** – From October 3–16, 1984, ORNL recommended 100 elevated gamma radiation anomalies in the Niagara Falls, New York area for an on-site survey to determine if the elevated levels of radiation may be related to the transportation of radioactive waste materials to the Lake Ontario Ordnance Works for storage [Ref. 3, p. 13]. During July 15–17, 1985, members of the RASA group at ORNL performed the radiological survey [Ref. 3, p. 13]. During the survey, the 738 Upper Mountain Road

location showed a maximum gamma exposure rate of 710 microroentgens per hour (μR/hr) [Ref. 3, p. 10]. The area with these readings was an area approximately 10 feet wide by 59 feet in length along a ditch and gravel residential driveway [Ref. 3, p. 16]. The survey, which included outdoor gamma exposure rates, showed that the 738 Upper Mountain Road anomaly is associated with the asphalt driveway that contained a phosphate slag material [Ref. 3, pp. 13]. This rocky-slag waste material was used for bedding under asphalt surfaces and in general gravel applications at the UMR site and 61 other locations in the Niagara Falls area identified by ORNL [Ref. 3, p. 13]. Biased surface soil samples collected in conjunction with the study indicated the presence of Ra-226, U-238, and Th-232 at the following respective concentrations at the depths of 0–15 cm: 92 ± 5 picocuries per gram (pCi/g), 70 pCi/g, and 560 ± 180 pCi/g [Ref. 3, p. 43]. The subsequent November 1986 report stated that all the contaminated soil and rock samples collected had approximately equal concentrations of Ra-226 and U-238, which suggested to the investigators that the rocks probably originated from a singular source [Ref. 3, p. 20]. The origin of the thorium-bearing material was unknown; the report postulated that its source was from some type of mineral extraction activity in the Niagara Falls area [Ref. 3, p. 19]. According to the report, this rocky-slag waste material was once involved in the electrochemical production of elemental phosphorous using uranium-bearing raw materials, and reportedly originated from the former Oldbury Furnace in Niagara Falls, New York [Ref. 3, p. 19]. The report stated that the 738 Upper Mountain Road anomaly was not related to materials connected with NFSS, including materials that were transported to NFSS [Ref. 3, pp. 8, 20].

- **On-site Reconnaissance, New York State Department of Environmental Conservation (NYSDEC), July 9, 2013** – During a reconnaissance performed by NYSDOH and NYSDEC on July 9, 2013, screening activities showed radiation levels at 300 μR/hr with a hand-held PIC and 105,000-110,000 CPM with an NaI 2x2 scintillation detector; the singular reading was taken at the end of the driveway [Ref. 11, pp. 1, 4].

- **On-site Reconnaissance, WESTON, September 10, 2013** – An on-site reconnaissance was conducted on September 10, 2013 to perform a gamma radiation screening on site [Ref. 2, Figure 3; 4, pp. 4–5]. Elevated gamma readings were observed toward the end of the driveway close to the road, in an approximately 45-foot by 45-foot gravel area [Ref. 2, Figure 3; 4, pp. 4–5]. The readings in the area of elevated gamma radiation ranged from greater than background levels (i.e., approximately 9,000 CPM) to greater than 300,000 CPM (i.e., readings greater than 35 times background gamma radiation) [Ref. 2, Figure 3; 4, pp. 4–5]. WESTON personnel also observed current site conditions and collected global positioning system (GPS) data [Ref. 12, p. 3].

- **Gamma Radiation Screening and Determination of the Area of Observed Contamination, WESTON, December 4 and 9, 2013 –** WESTON personnel delineated the area of observed contamination by measuring the gamma radiation exposure rates within and around the source area and at background locations [Ref. 4, pp. 6–10]. Three pieces of equipment were used to delineate the site: Ludlum Model

2221 Ratemeter and Model 44-10 Gamma Scintillator (2" x 2" NaI probe), Ludlum Model 19 gamma µR/meter, and GE Reuter-Stokes PIC Model-RSS-131, which measure in units of CPM, µR/hr, and millirem per hour (mrem/hr), respectively [Ref. 4, pp. 6–10; 32, pp. 1–2]. Areas of observed contamination can be defined by site-attributable gamma radiation exposure rates, as measured by a survey instrument held one meter above the ground surface, which equal or exceed two times (2x) the site-specific background gamma radiation exposure rate [Ref. 1, p. 1; 32, p. 1]. At the UMR site, an area of approximately 1,493 square feet (ft^2) was found to have gamma radiation exposure rates that exceed 2x the background measurement of 16,752 cpm [Ref. 2, Figures 4, 7, and 8]. PIC data were collected at several points to confirm the boundary [Ref. 2, Figure 3].

- **Soil Sampling, WESTON, December 12, 2013** – On December 12, 2013, WESTON personnel collected a total of nine soil samples (including one environmental duplicate sample) and two slag samples from the site in support of the site inspection (SI) report evaluation [Ref. 2, Figure 4; 4, pp. 11–13, 15; 12, p. 3]. Samples were collected from eight boreholes advanced throughout the area of observed contamination using hollow-stem auger drilling methods and hand augers [Ref. 4, pp. 11–13, 15; 12, p. 3]. Soil samples were collected directly beneath slag material in order to determine if the surrounding soil has been impacted by radioactive slag material [Ref. 2, Figure 4; 4, pp. 11–13, 15; 12, p. 3]. Soil samples were also collected to document background conditions from two locations outside of the influence of site activities [Ref. 2, Figure 4; 11, pp. 11–15; 12, p. 3; 31, pp. 1–2]. Analytical results indicate that concentrations of radionuclides detected in the source samples (slag) and soil collected on the UMR site are significantly higher than concentrations documented at background sample locations [Ref. 2, Figure 4; 30, pp. 21–24; 31, pp. 1–2].

- **Site Inspection Air Monitoring, May 2014** – On May 1 and 2, 2014, WESTON personnel collected radon and thoron concentration measurements from locations on and in the vicinity of the UMR site [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. At the selected locations in background areas, above the source material, and off the source area, radon and thoron concentration measurements in pCi/L were collected with RAD7 radon detectors [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. The radon and thoron measurements were collected at heights of one meter above the ground surface [Ref. 4, pp. 14-19, 29-30; 34, pp. 2-5]. During the May 2014 air monitoring event, background radon concentrations were measured as 0.16 +/- 0.13 pCi/L (to account for maximum background concentrations, the uncertainty value is added to the background measurement for an adjusted concentration of 0.29 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.070 pCi/L (adjusted concentration is 0.12 pCi/L) during the afternoon hours on May 1, 2014 [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 4-5, 9, 11]. Background thoron concentrations were calculated to be 0.00 +/- 0.060 pCi/L (adjusted concentration is 0.060 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.10 pCi/L (adjusted concentration is 0.15 pCi/L) during the afternoon hours on May 1, 2014 [Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 4-5, 9, 11]. To account for minimum possible release concentrations, the uncertainty value for each potential release measurement

collected above and downwind of source areas is subtracted from the measurement to calculate the adjusted concentration [Ref. 34, pp. 2-5]. There were no radon or thoron concentrations that exceeded the site-specific background, nor were there any adjusted concentrations that equaled or exceeded a value two standard deviations above the mean site-specific background concentration for that radionuclide in that type of sample [Ref. 2, Figure 9; 34, pp. 2-5, 9, 11].

a) Is the site or any waste source subject to Petroleum Exclusion provisions? Identify petroleum products and by-products that justify this decision.

There are no known historical or currently identified sources at the subject property that would be subject to said provisions.

Ref. 8, pp. 13–16.

b) Has normal farming application of pesticides registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) occurred at the site? Have pesticides been produced or stored at the site? Have there been any leaks or spills of pesticides on site?

The site was not used for agricultural purposes. The site is located in a historically commercial and residential area of Lewiston, NY. Pesticide analyses were not conducted for soil samples collected from the site by WESTON in December 2013.

Ref. 4, pp. 16–22; 6, pp. 4–12; 8, pp. 13–16; 12, p. 2.

c) Is the site or any waste source subject to Resource Conservation and Recovery Act (RCRA) Subtitle C (briefly explain)?

The current owner of the Site, TBBC, does not hold any RCRA permits. The land is vacant and undeveloped.

Ref. 4, pp. 8–10; 6, pp. 4–12; 8, pp. 13–16.

d) Is the site or any waste source maintained under the authority of the Nuclear Regulatory Commission (NRC)?

The Site or subject property is not included in the Material Licensing Tracking System (MLTS) database. The MLTS is maintained by the NRC and contains a list of sites that possess or use radioactive materials. The ORNL November 1986 report stated that the 738 Upper Mountain Road anomaly was not related to materials connected with NFSS, including materials that were transported to NFSS.

Ref. 3, p. 14; 8, pp. 13–16.

16. Do any conditions exist on site which would warrant immediate or emergency action?

No conditions were noted that would warrant immediate or emergency action.

Ref. 4, pp. 1–22

17. Information available from:

Contact: Andrew Fessler	Agency: EPA Region II	Telephone No.: 212-637-4333
Preparer: Denise Breen	Agency: Region V START III	Date: May 2014

PART II: WASTE SOURCE INFORMATION

For each of the waste units identified in Part I, complete the following items.

Waste Unit 1 - Contaminated Soil

Source Type

_____Landfill	___X___Contaminated Soil
_____Surface Impoundment	_____ Pile
_____Drums	_____ Land Treatment
_____Tanks/Containers	_____Other

Description:

1. Describe the types of containers, impoundments, or other storage systems (i.e., concrete - lined surface impoundments) and any labels that may be present.

   During July 1985, members of the RASA group at ORNL performed the radiological survey. During the survey, the 738 Upper Mountain Road location showed a maximum gamma exposure rate of 710 microroentgens per hour (μR/hr). The area with these readings was an area approximately 10 feet wide by 59 feet in length along a ditch and gravel residential driveway and is associated with the asphalt driveway that contained a phosphate slag material. This rocky-slag waste material was used for bedding under asphalt surfaces and in general gravel applications at the UMR site and 61 other locations in the Niagara Falls area identified by ORNL. Biased surface soil samples collected in conjunction with the study indicated the presence of radium-226 (Ra-226), uranium-238 (U-238), and thorium-232 (Th-232) at the UMR site. The subsequent November 1986 report stated that all the contaminated soil and rock samples collected had approximately equal concentrations of Ra-226 and U-238, which suggested to the investigators that the rocks probably originated from a singular source. The origin of the thorium-bearing material was unknown; the report postulated that its source was from some type of mineral extraction activity in the Niagara Falls area. According to the report, this rocky-slag waste material was once involved in the electrochemical production of elemental phosphorous using uranium-bearing raw materials, and reportedly originated from the former Oldbury Furnace in Niagara Falls, New York. The report stated that the 738 Upper Mountain Road anomaly was not related to materials connected with Niagara Falls Storage Site (NFSS), including materials that were transported to NFSS.

   During a reconnaissance performed by the New York State Department of Health (NYSDOH) and NYSDEC on July 9, 2013, screening activities showed radiation levels at 300 μR/hr with a hand-held pressurized ion chamber (PIC) and 105,000-110,000 counts

per minute (CPM) with a sodium iodide (NaI) 2x2 scintillation detector; the singular reading was taken at the end of the driveway adjacent to Upper Mountain Road.

In order to establish the area of observed contamination, WESTON performed a complete gamma screening of the site. Significant readings (i.e., 2x the site-specific background) of gamma screening results were used to establish an area of observed contamination. Approximately 0.03 acres, or 1,493 ft^2, show 2x the site-specific background readings. In addition to performing a gamma screening of the site, WESTON collected slag and soil samples directly beneath the presence of radioactive waste/slag material. In areas without the presence of slag material, the sample was collected at a similar depth to sample locations which had slag material. The analytical results indicate significant concentrations of radionuclides in both slag samples and six soil samples (including a soil sample duplicate) at the UMR site.

Ref. 2, Figures 4, 7, and 8; 3, pp. 8–10,12–14, 27, 34; 4, pp. 6–22; 11, pp. 1, 4; 12, pp. 4–7; 30, pp. 1–24; 31, pp. 1–2; 32, pp. 1–3.

2. Describe the physical condition of the containers or storage systems (i.e., rusted and/or bulging drums).

   There is no storage system in place. The area of observed contamination is not contained.

   Ref. 4, pp. 6–22.

3. Describe any secondary containment that may be present (e.g., drums on concrete pad in building or aboveground tank surrounded by berm).

   There is no secondary containment associated with the area of observed slag and soil contamination.

   Ref. 4, pp. 6–22.

Hazardous Waste Quantity

In order to establish the area of observed contamination, WESTON performed a complete gamma screening of the site. Significant readings (i.e., 2x the site-specific background) of gamma screening results were used to establish an area of observed contamination of approximately 0.03 acres, or 1,493 ft^2. The approximate depth of the slag material is 0–8 inches below the ground surface (bgs). The volume of on-site contaminated soil is unknown; therefore, the area measure is used as the hazardous waste quantity for the purpose of this report.

Ref. 1, pp. 1–5; 2, Figures 4, 7, and 8; 4, p. 15; 12, pp. 3–7.

Hazardous Substances/Physical State

The hazardous presence of gamma radiation that is 2x the site-specific background (16,752 cmp) was used to define the area of observed contamination of gamma exposure rates. To establish observed contamination for a site-attributable radionuclide in soil, the measured concentration: 1) equals or exceeds a value two standard deviations above the mean site-specific background concentration for that radionuclide, or 2) exceeds the upper-limit value of the range of regional background concentration. Employing these criteria, as well as evaluating the overall radiochemistry of the samples, the following contaminants are present at significant concentrations in the source: uranium-238, thorium-230, uranium-233/234, radium-226, thorium-232, radium-228, thorium-228, and uranium-235/236. The physical state of on-site contaminated soil and slag is solid.

Ref. 1, pp. 1–5; 2, Figures 4, 7, and 8; 4, p. 15; 12, pp. 3–7; 30, pp. 21–24.

PART III. SAMPLING RESULTS

GAMMA DELINEATION -

In accordance with Hazard Ranking System (HRS) requirements for naturally-occurring radionuclides, areas of observed contamination are defined by site-attributable gamma radiation exposure rates, as measured by a survey instrument held one meter above the ground surface, which equal or exceed two times the site-specific background gamma radiation exposure rate obtained with the same type of instrument [Ref. 1, pp. 1–5; 32, pp. 1–3]. On December 4 and 9, 2013, WESTON personnel delineated the area of observed contamination by measuring the gamma radiation exposure rates within and around the source area and at background locations [Ref. 4, pp. 6–10; 12, p. 4; 32, pp. 1–3].

Three pieces of equipment were used to delineate the site: Ludlum Model 2221 Ratemeter and Model 44-10 Gamma Scintillator (2" x 2" NaI probe), Ludlum Model 19 gamma µR/meter, and GE Reuter-Stokes PIC Model-RSS-131, which measure in units of cpm, µR/hr, and mrem/hr, respectively [Ref. 12, p. 4; 32, pp. 1–2]. At the UMR site, an area of approximately 1,493 ft^2 was found to have gamma radiation exposure rates that exceed two times the background measurement of 16,752 cpm [Ref. 2, Figures 3 and 4; 32, pp. 1–3]. PIC data were collected at several boundary points to confirm the boundary [Ref. 12, p. 4; 32, pp. 1–2].

The PIC measures true gamma radiation exposure rate, with an energy correction factor (a.k.a. energy response factor) of less than 2 percent, whereas the scintillation detector can have a much higher energy correction factor depending on the average gamma energy to which it is exposed [Ref. 32, pp. 1–3]. Therefore, PIC measurements are generally thought to be the more accurate method to measure the gamma radiation exposure rate [Ref. 32, pp. 1–3]. Scintillation detectors are more commonly available than the PIC as field instruments because they are significantly less expensive, lighter, and quicker [Ref. 32, pp. 1–3]. PIC measurements required a minimum of five minutes at each measurement location, whereas the scintillation detector required only one minute [Ref. 32, pp. 1–3].

A total of 13 locations, including two background locations, on the site were surveyed for gamma radiation exposure rate using the PIC, and concurrently for gamma count rate using the scintillation detector [Ref. 2, Figures 7 and 8; 32, pp. 1–2]. The purpose of collecting both types of measurements at each location was to evaluate the data for a linear relationship [Ref. 32, p. 3].

The PIC was placed at each of the 13 measurement locations for a minimum of three minutes to allow the response of the instrument to stabilize [Ref. 2, Figure 8; 12, p. 4]. The locations are shown in Figure 8 [Ref 2, Figure 8]. Data were collected at sample locations and boundary locations for a total of 5 minutes (10 minutes for background sample locations) at six-second intervals and stored in the instrument's internal memory for subsequent downloading to a laptop [Ref. 2, Figure 8; 4; pp. 6–10; 12, p. 4]. The downloaded six-second measurement data were subsequently reviewed by a WESTON Senior Safety Officer [Ref. 32, pp. 1–3]. Based on the interpretation of the data, an average of the gamma radiation exposure rate at each location was calculated from the 5-minute interval PIC data [Ref. 32, pp. 1–3]. The scintillation detector was operated in the scalar mode, collecting data for one minute (10 minutes for background

locations) [Ref. 4, p. 14; 32, pp. 1–3].

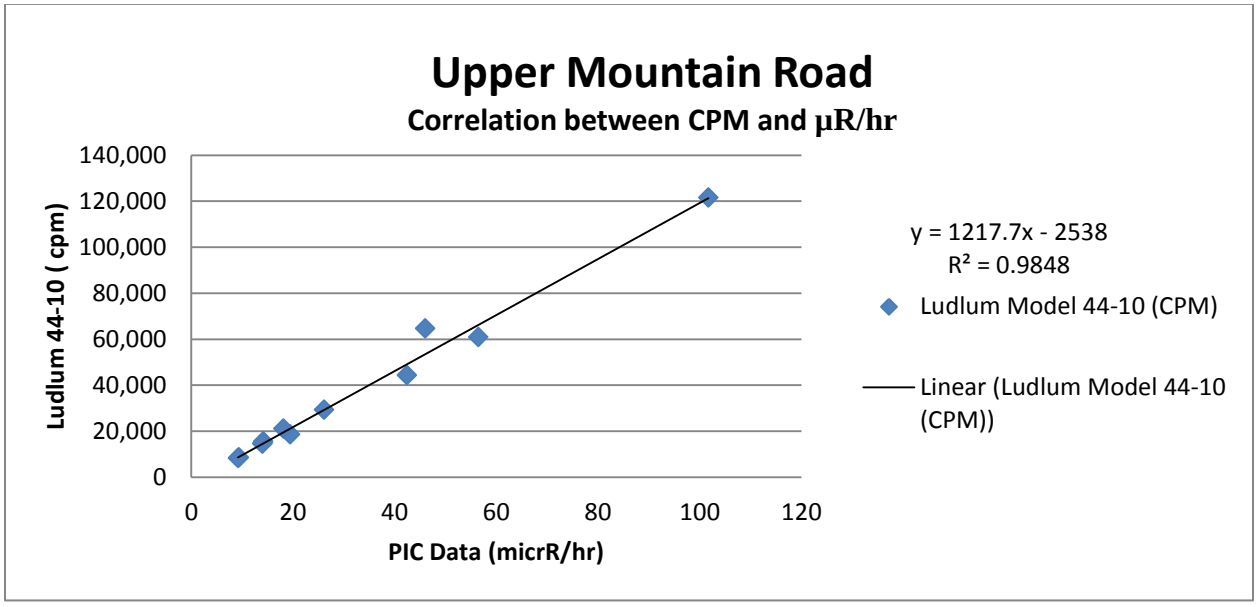
The scintillation detector data in cpm and the PIC gamma radiation exposure rates in µR/hr for all measurement locations are presented in Table 1 [Ref. 4, p. 14]. The scintillation detector data are shown in Figure 7 and the gamma radiation exposure rate data are shown in Figure 8 [Ref. 2, Figures 7 and 8].

The primary objective of the survey was to delineate the source area by mapping the boundary line where the gamma radiation exposure rate at the UMR site equals two times the site-specific background gamma radiation exposure rate [Ref. 32, p. 1]. To evaluate this boundary, two locations were initially screened and measured as possible background locations [Ref. 4, pp. 6–10, 14]. The site-specific background gamma radiation exposure rate was thus determined to be 9.2 +/- 0.2 µR/hr [Ref. 4, pp. 6–10, 14]. Therefore, two times the site-specific background gamma radiation exposure rate is 18.5 µR/hr [Ref. 4, p. 14].

Based on screening with the scintillation detector, gamma radiation exposure rate measurement locations were preferentially selected as being slightly below or slightly above two times background in order to evaluate the extent of the source area [Ref. 2, Figure 7; 4, pp. 6–10, 14]. Based on these measurements, the boundary of the source area defined by readings that equal or exceed 18.5 µR/hr is depicted in Figure 8 [Ref. 2, Figure 8]. This delineated extent of the source area has an approximate correlation to the area of contamination delineated by soil sample analytical results [Ref. 32, p. 3].

Of possible significance, the highest gamma exposure rate detected by the PIC was 101.73 µR/hr [Ref. 2, Figure 8]. The location of this measurement, sample location S-03, is located in the most northeastern portion of the driveway [Ref. 2, Figure 8].

Based on the collected data, the linear relationship of Gamma radiation exposure rate (µR/hr) = (*x* cpm + 2,538)/1217.7 is shown in the graph below [Ref. 32, pp. 1–2].



The area is delineated by the Source Boundary presented in Figures 4, 7, and 8 [Ref. 2, Figures 4, 7, and 8].

SOIL/SLAG SAMPLING

On December 12, 2013, WESTON personnel collected a total of nine soil samples (including one environmental duplicate sample) and two radioactive waste material samples from the Site [Ref. 2, Figure 4; 4, pp. 11–13, 15, 20–22; 12, pp. 2–4, 6–7; 30, pp. 1–24; 32, pp. 1–3]. The soil samples were collected from a total of eight boreholes located on parcel 115.08-1-27 and the 738 Upper Mountain Road property in Lewiston, NY [Ref. 2, Figure 4; 4, pp. 11–13, 15, 20–22; 12, pp. 2–4, 6–7; 30, pp. 1–24]. Six soil samples were collected from six locations within the gravel/semi-paved driveway area located on parcel 115.08-1-27 [Ref. 2, Figure 4; 4, pp. 11–13, 15, 20–22; 12, pp. 2–4, 6–7; 30, pp. 1–24]. Two soil samples were collected southeast of the area of observed contamination and are considered to be background sample locations [Ref. 2, Figure 4; 4, pp. 11–13, 15, 20–22; 12, pp. 2–4, 6-7; 30, pp. 1–24].

At each borehole location, a temporary PVC casing was set at the borehole location. A gamma scintillation meter (Ludlum Model 2221 Ratemeter and Model 44-62 Gamma Scintillator with 0.5" x 1" NaI probe) was descended into the temporary PVC casing in order to determine the highest gamma radiation reading within each borehole [Ref. 12, p. 3]. The objective was to use the highest gamma radiation readings, along with visual documentation of the presence of slag, to establish sample depths [Ref. 12, p. 3]. The PVC casing was used to prevent damage to the equipment as well as obtaining the most accurate data [Ref. 12, p. 3]. A one-minute count was recorded at every 6-inch interval down to 4 feet [Ref. 4, p. 11–13, 15; 12, p. 3]. The radioactive waste material was found at ground surface to a depth of approximately 8 inches below ground surface [Ref. 4, pp. 11–13, 15; 12, p. 3]. The soil samples were collected directly below the radioactive waste material using dedicated sampling equipment [Ref. 12, pp. 4, 6]. Soil and slag source samples were collected from the UMR property; background samples were collected south of the source area [Ref. 2, Figure 4; 12, p. 3]. Background soil sample locations were determined based on low gamma screening findings [Ref. 2, Figure 4; 12, p. 3].

The slag samples consisted of pulverized silty sand with rocks, cobbles, and gravel (i.e., radioactive waste material mixture) rather than singular pieces of slag [Ref. 4, p. 12; 12, pp. 2–4, 6]. Although the depth intervals from which this slag material came showed the highest gamma readings in their respective boreholes, the sampled material itself did not indicate elevated gamma readings [Ref. 4, p. 15].

The soil, slag, and aqueous rinsate blank samples were analyzed by Test America Laboratories, Earth City, Missouri, for TAL metals including mercury analysis; IsoTh, IsoU, Radium-226, and Radium-228 by alpha spectroscopy; and radioisotopes by gamma spectroscopy [Ref. 12, p. 2, 13–16; 30, pp. 1–24]. One soil sample for TAL metals analysis was designated as a MS/MSD sample for QA/QC purposes [Ref. 4 pp. 11–13; 12, pp. 2, 13–16; 30, pp. 3–4]. One rinsate blank was collected to demonstrate adequate decontamination of non-dedicated sampling equipment (e.g., cutting shoe) [Ref. 4, pp. 11–13; 12, pp. 2, 13–16; 30, pp. 3–4].

WESTON logged soil and slag sample locations and areas of observed contamination locations electronically using GPS equipment and performed post-processing differential correction of the GPS data in accordance with EPA Region 2 GPS Standard Operating Procedures [Ref. 12, p. 4]. The processed GPS data for all samples have been transferred to the Sample Location and Source Map (Figure 3) using Geographic Information Systems [Ref. 12, p. 4].

The HRS states that in order to establish observed contamination for a site-attributable radionuclide in soil or slag, the measured concentration: 1) equals or exceeds a value of two standard deviations above the mean site-specific background concentration for that radionuclide or 2) exceeds the upper-limit value of the range of regional background concentration. Employing the aforementioned criteria, as well as evaluating the overall radiochemistry of the samples, significant values were established for the site. Significant detections of radionuclides are noted below:

- Of the six soil samples collected in the area of observed contamination, five are considered to contain significant concentrations of radionuclides;
    - There were five sample locations which exhibit significant concentrations of the Thorium-232 decay series: 2224-S01, -S03 (duplicate sample 2224-S10 collected at –S03), -S04, -S05, and -S06. The highest analytical result reported for the Th-232 decay series was for sample 2224-S01 with a Th-232 result of 23.9 +/- 2.37 pCi/g and the Th-228 result of 25.1 +/- 2.47 pCi/g. The Ra-228 concentration for this sample was significantly elevated, and not in equilibrium at 88.5 +/- 9.26 pCi/g. All of the other soil samples, except 2224-S07, were slightly elevated with a maximum Th-232 concentration of 4.31 +/- 0.577 pCi/g (-S04), for Th-228 concentration of 4.54 +/- 0.599 pCi/g (-S04), and Ra-228 7.05 +/- 0.920 pCi/g (-S04). Analytical results for sample 2224-S07 are near background concentrations for each isotope and therefore the results are not considered to be significantly above background. In samples 2224-S03, -S04, -S05, and -S10, the Ra-228 concentration is greater than all of the other isotopes in each sample and therefore they do not appear to be in equilibrium. The individual radioisotopes of the Th-232 decay series for sample 2224-S06 appear to be in equilibrium.
    - There is only one sample location which exhibits significant concentrations of the Uranium-238 decay series: 2224-S01. The highest concentration reported for the U-238 decay series was documented in sample 2224-S01 with a U-238 concentration of 5.86 +/- 0.687 pCi/g a U-233/234 concentration of 6.87 +/- 0.777 pCi/g, a Th-230 concentration of 4.74 +/- 0.690 pCi/g, and a Ra-226 concentration of 15.7 +/- 2.10 pCi/g which perhaps indicates that the material was not in equilibrium. Analytical results for samples 2224-S03, -S04, -S05, -S06, -S07, and -S10 are below or near background levels. In samples 2224-S03, -S04, -S06, -S07, and -S10, the Ra-226 is greater than all other isotopes in each sample, but only by a small amount and are not considered to be significantly above background due to uncertainty associated with the reported values.
    - Analytical results reported for U-235/236 were all at background levels besides one sample location: 2224-S01. Sample location 2224-S01 which had an elevated concentration of 0.389 +/- 0.142 pCi/g.

Ref. 2, Figure 4; 30, pp. 21–23; 31, pp. 1–5.

- Both of the slag samples exhibited elevated activity in both the U-238 and Th-232 decay series. The ratios of the individual isotopes within each decay series were consistent, indicating that the slag material may be from the same source. While the concentrations in each sample were different, the relative ratios appeared consistent with Th-232 decay series concentrations being greater than U-238 decay series concentrations. In both samples, the Ra-228 appears to be greater than the Th-232 and Th-228, while the Ra-226 appears to be in equilibrium with the U-238. There was also a significant concentration of U-235/236 in both slag samples.

Ref. 2, Figure 4; 30, p. 24; 31, pp. 1–2.

Based on the analytical data collected, significant concentrations of radionuclides were found in the soil collected at sample locations 2224-S01, -S03, -S04, -S05, and -S06 [Ref. 2, Figure 4; 30, pp. 21–24; 31, pp. 1–3]. Contaminated slag was documented on site at both sample locations (i.e., 2224-SG01 and -SG02) [Ref. 2, Figure 4; 30, pp. 21–24; 31, pp. 1–2]. Analytical results further conclude that the radioactive source material (slag) is located at the northern portion of the driveway and extends east and west (into the grassy area adjacent to the gravel driveway) approximately 15 feet in both directions. The slag material is not known to extend to sample location 2224-S07 as a result of no significant radionuclide concentrations being documented at location 2224-S07.

A summary of the soil and slag sample analytical results and their significance is presented in Figure 4.

AIR MONITORING

On May 1 and 2, 2014, WESTON personnel collected air monitoring data with RAD7 radon detectors [Ref. 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11]. During the May 2014 air monitoring event, background radon concentrations were measured as 0.16 +/- 0.13 pCi/L (to account for maximum background concentrations, the uncertainty value is added to the background measurement for an adjusted concentration of 0.29 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.070 pCi/L (adjusted concentration is 0.12 pCi/L) during the afternoon hours on May 1, 2014 [Ref. 2, Figure 9; 4, pp. 14-19; 34, pp. 2-5, 9, 11]. Background thoron concentrations were calculated to be 0.00 +/- 0.060 pCi/L (adjusted concentration is 0.060 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.10 pCi/L (adjusted concentration is 0.15 pCi/L) during the afternoon hours on May 1, 2014 [Ref. 2, Figure 9; 4, pp. 14-19; 34, pp. 2-5, 9, 11]. To account for minimum possible release concentrations, the uncertainty value for each potential release measurement collected above and downwind of source areas is subtracted from the measurement to calculate the adjusted concentration [Ref. 34, pp. 2-5, 9, 11]. There were no radon or thoron concentrations that exceeded the site-specific background, nor were there any adjusted concentrations that equaled or exceeded a value two standard deviations

above the mean site-specific background concentration for that radionuclide in that type of sample; therefore, a release of hazardous substances from the UMR site to air is not observed [Ref. 2, Figure 9; 34, pp. 4-5, 9, 11]. Table 2 presents the air monitoring results.

Table 1. UMR Complete Analytical Results for Soil and Slag

Location ID	S01				S03				S10 Duplicate of S03				S04				S05				S06				S07			
	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit
Uranium-238	5.86	+/- .687	V	pCi/g	1.01	+/- .226	V	pCi/g	0.939	+/- .219	V	pCi/g	1.40	+/- .280	V	pCi/g	0.963	+/- .221	V	pCi/g	1.24	+/- .256	V	pCi/g	0.835	+/- .203	V	pCi/g
Thorium-230	4.74	+/- .690	V	pCi/g	1.09	+/- .252	V	pCi/g	0.990	+/- .231	V	pCi/g	1.60	+/- .306	V	pCi/g	1.39	+/- .272	V	pCi/g	1.43	+/- .274	V	pCi/g	0.941	+/- .210	V	pCi/g
Uranium-233/234	6.87	+/- .777	V	pCi/g	0.867	+/- .210	V	pCi/g	1.02	+/- .229	V	pCi/g	1.30	+/- .268	V	pCi/g	1.04	+/- .230	V	pCi/g	0.979	+/- .224	V	pCi/g	0.765	+/- .194	V	pCi/g
Radium-226	15.7	+/- 2.10	V	pCi/g	1.37	+/- .277	V	pCi/g	1.37	+/- .266	V	pCi/g	2.22	+/- .448	V	pCi/g	1.21	+/- .274	V	pCi/g	1.54	+/- .300	V	pCi/g	1.25	+/- .363	V	pCi/g
Location ID	S01				S03				S10				S04				S05				S06				S07			
Thorium-232	23.9	+/- 2.37	V	pCi/g	1.68	+/- .323	V	pCi/g	2.05	+/- .354	V	pCi/g	4.31	+/- .577	V	pCi/g	1.77	+/- .314	V	pCi/g	2.95	+/- .431	V	pCi/g	1.02	+/- .219	V	pCi/g
Radium-228	88.5	+/- 9.26	V	pCi/g	2.31	+/- .448	V	pCi/g	4.23	+/- .645	V	pCi/g	7.05	+/- .920	V	pCi/g	2.54	+/- .484	V	pCi/g	2.99	+/- .490	V	pCi/g	0.987	+/- .387	V	pCi/g
Thorium-228	25.1	+/- 2.47	V	pCi/g	1.67	+/- .323	V	pCi/g	2.46	+/- .399	V	pCi/g	4.54	+/- .599	V	pCi/g	2.06	+/- .345	V	pCi/g	2.85	+/- .421	V	pCi/g	1.13	+/- .237	V	pCi/g
Location ID	S01				S03				S10				S04				S05				S06				S07			
Uranium-235/236	0.389	+/- .142	V	pCi/g	0.0683	+/- .0613	V	pCi/g	0.0411	+/- .0476	V	pCi/g	0.0636	+/- .0650	U	pCi/g	0.0192	+/- .0388	U	pCi/g	0.0603	+/- .0616	U	pCi/g	0.0674	+/- .0605	V	pCi/g
Reference	Ref. 33, p.15-16				Ref. 33, p.16-17				Ref. 33, p.25				Ref. 33, p.18				Ref. 33, p.19				Ref. 33, p.20				Ref. 33, p. 22-23			

Location ID	SG01				SG02				S08 Background				S09 Background			
	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit	Result	Total Certainty	Qualifier	Unit
Uranium-238	8.68	+/- .940	V	pCi/g	26.7	+/- 2.55	V	pCi/g	0.597	+/- .168	V	pCi/g	1.29	+/- .265	V	pCi/g
Thorium-230	3.69	+/- .531	V	pCi/g	21.8	+/- 3.43	V	pCi/g	0.993	+/- .224	V	pCi/g	1.16	+/- .249	V	pCi/g
Uranium-233/234	7.84	+/- .867	V	pCi/g	27.0	+/- 2.58	V	pCi/g	0.799	+/- .197	V	pCi/g	1.05	+/- .235	V	pCi/g
Radium-226	9.33	+/- 1.16	V	pCi/g	32.6	+/- 3.97	V	pCi/g	1.05	+/- .250	V	pCi/g	1.03	+/- .265	V	pCi/g
Location ID	SG01				SG02				S08 Background				S09 Background			
Thorium-232	19.7	+/- 1.93	V	pCi/g	116	+/- 11.7	V	pCi/g	0.835	+/- .203	V	pCi/g	1.12	+/- .242	V	pCi/g
Radium-228	52.4	+/- 5.48	V	pCi/g	165	+/- 17.1	V	pCi/g	1.54	+/- .309	V	pCi/g	1.37	+/- .299	V	pCi/g
Thorium-228	20.1	+/- 1.97	V	pCi/g	119	+/- 12	V	pCi/g	1.08	+/- .237	V	pCi/g	1.31	+/- .268	V	pCi/g
Location ID	SG01				SG02				S08 Background				S09 Background			
Uranium-235/236	0.427	+/- .152	V	pCi/g	1.48	+/- .345	V	pCi/g	0.0533	+/- .0535	V	pCi/g	0.0677	+/- .0634	V	pCi/g
Reference	Ref. 33, p.26				Ref. 33, p.27-28				Ref. 33, p.22-23				Ref. 33, p.24			

V = Verified by Certified Health Physicist
U = Indicates the analyte was analyzed for but not detected
pCi/g = picocurie per gram

Upper Mountain Road

Table 1 - Average Radon and Thoron Concentrations

Location ID	AM or PM	Meter S/N	Date/Time (end)	Air Temp. [C]	RH [%]	Battery Voltage	Calculated Radon [pCi/L]	Uncertainty [pCi/L]	Adjusted Radon [piC/L]
Background 1	AM	2857	5/2/2014 10:30	12.6	2.00%	6.14	0.16	0.13	0.29
Background 2	PM	2968	5/1/2014 17:15	26.5	3.00%	6.16	0.051	0.070	0.12
Source 1	AM	2970	5/2/2014 10:30	12.4	3.00%	6.17	0.026	0.052	-0.026
Source 2	PM	2857	5/1/2014 17:15	23.9	3%	6.14	0.054	0.080	-0.026
Source 2 (DUP)	PM	2941	5/1/2014 17:15	22.9	3.33%	6.24	0.00	0.18	-0.18
Downwind 1	AM	2941	5/2/2014 10:30	13	4%	6.24	0.052	0.070	-0.018
Downwind 2	AM	2968	5/2/2014 10:30	13.5	2.67%	6.16	0.10	0.10	0.00
Downwind 3	PM	2970	5/1/2014 17:15	20.5	3.00%	6.17	0.049	0.070	-0.021

Location ID	AM or PM	Meter S/N	Date/Time (end)	Air Temp. [C]	RH [%]	Battery Voltage	Calculated Thoron [pCI/L]	Uncertainty [pCi/L]	Adjusted Thoron [piC/L]
Background 1	AM	2857	5/2/2014 10:30	12.6	2.00%	6.14	0.00	0.06	0.060
Background 2	PM	2968	5/1/2014 17:15	26.5	3.00%	6.16	0.050	0.10	0.15
Source 1	AM	2970	5/2/2014 10:30	12.4	3.00%	6.17	0.00	0.06	-0.060
Source 2	PM	2857	5/1/2014 17:15	23.9	3%	6.14	0.00	0.06	-0.060
Source 2 (DUP)	PM	2941	5/1/2014 17:15	22.9	3.33%	6.24	0.16	0.18	-0.021
Downwind 1	AM	2941	5/2/2014 10:30	13	4%	6.24	0.11	0.15	-0.044
Downwind 2	AM	2968	5/2/2014 10:30	13.5	2.67%	6.16	0.16	0.18	-0.025
Downwind 3	PM	2970	5/1/2014 17:15	20.5	3.00%	6.17	0.00	0.06	-0.060

PART IV: HAZARD ASSESSMENT

GROUNDWATER ROUTE

1. Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence and relationship to background.

A release to groundwater is not suspected.

Ref. 2, Figure 5; 17, pp. 1–23; 18, pp. 1–2.

2. Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.

The site is underlain by glacial sediments consisting primarily of till and lacustrine silt and clay, which have a thickness of approximately 10 feet. These deposits act as a confining unit that limits flow of water to and from the more permeable weathered bedrock below the sediments. However, there is no known use of groundwater for drinking water supplies within 4 miles of the site.

The glacial sediments are underlain by about 170 feet of virtually undeformed dolomites and limestone of the Lockport Group of the Niagaran Series. The hydraulic properties of the Lockport Group are related primarily to secondary permeability caused by fractures and vugs. The principal water-bearing zones in the Lockport Group are the weathered bedrock surface and horizontal-fracture zones. This weathered rock ranges from 10–25 feet in thickness. The fractures in this zone show signs of weathering and have been widened by chemical dissolution.

The Lockport Group is in turn underlain by the Clinton Group, which consists of about 100 feet of shale and limestone. A natural-gas reservoir in the underlying Clinton Group prevents downward flow of water from the Lockport Group.

The Medina Group, which consists of about 110 feet of sandstone and shale underlie the Clinton Group. The Richmond Group underlies the Medina Group and consists of brick-red sandy to argillaceous shale with an average thickness of 1,200 feet.

The Niagara River is the ultimate point of discharge for most groundwater in the Niagara Falls area. Recharge from overlying glacial sediments enters the weathered bedrock. Recharge also enters the Lockport Group through infiltration from the Niagara River in areas where the bedrock crops out in the river bottom as well as recharge from the infiltration from the New York Power Authority (NYPA) reservoir. General groundwater flow direction is west.

Geologic Unit	Depth (Approximate)	Thickness (Approximate)
Glacial sediments	0 feet	Maximum 10 feet
Weathered bedrock	>10 feet	10–25 feet
Lockport Group	>20 feet	170 feet
Clinton Group	>190 feet	100 feet
Medina Group	>290 feet	110 feet
Richmond Group	400 feet	1,200 feet
Bedrock	<1600 feet	N/A

Ref. 2, Figure 5; 22, pp. 6–15.

3. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?

Analytical data of on-site soil samples collected from sample locations 2224-S01, -S03, -S04, -S05, and -S06 (greatest depth 2.5-3 feet below ground surface) indicated significant detections of radionuclides. There are no aquifers utilized for public water supply use within 4 miles of the site; therefore, there is no underlying aquifer of concern.

Ref. 2, Figures 1 and 4; 30, pp. 21–24; 31, pp. 1–3, 32, pp. 1–3.

4. What is the permeability value of the least permeable continuous intervening stratum between the ground surface and the top of the aquifer of concern?

Although analytical data of on-site soil samples indicate the presence of elevated radionuclides, there are no aquifers utilized for public water supply use within four miles of the site. Therefore, there is no underlying aquifer of concern. Additionally, the overlying on-site glacial sediments serve as a confining unit. The reported hydraulic conductivity of the glacial sediments is approximately $2x10^{-3}$ feet per day (i.e., $7x10^{-7}$ centimeters per second [cm/s]).

Ref. 2, Figure 5; 17, pp. 1–23; 18, pp. 1–2; 22, p 8.

5. What is the net precipitation at the site (inches)?

Net precipitation at the site is approximately 40.5 inches per year.

Ref. 28, p. 1.

6. What is the distance to and depth of the nearest well that is currently used for drinking purposes?

There are no active public supply wells located within a 4-mile radius of the Site.

Ref. 2, Figure 5; 17, pp. 1–23; 18, pp. 1–2.

7. If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be actually contaminated by hazardous substance(s) attributed to an observed release from the site.

A release to groundwater of site-attributable contaminants is not suspected. Question No. 1 provides a discussion of the likelihood of a groundwater release of site-attributable contaminants.

Ref. 2, Figure 5; 17, pp. 1–23; 18, pp. 1–2.

8. Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

Distance	**Population**
0 - ¼ mile	None identified.
>¼ - ½ mile	None identified.
>½ - 1 mile	None identified.
>1 - 2 miles	None identified.
>2 - 3 miles	None identified.
>3 - 4 miles	None identified.

Ref. 2, Figure 5; 17, pp. 1–23; 18, pp. 1–2.

State whether groundwater is blended with surface water, groundwater, or both before distribution.

There are no active public supply wells located within a 4-mile radius of the Site. The public water system source is solely surface water.

Ref. 2, Figure 5; 17, pp. 1–23; 18, pp. 1–2.

Is a designated wellhead protection area within 4 miles of the site?

There are no active public supply wells located within a 4-mile radius; therefore, there are no designated wellhead protection areas within 4 miles of the Site.

Ref. 2, Figure 5; 18, pp. 1–2.

Does a waste source overlie a designated or proposed wellhead protection area? If a release to groundwater is observed or suspected, does a designated or proposed wellhead protection area lie within the contaminant boundary of the release?

There are no active public supply wells located within a 4-mile radius; therefore, there are no designated wellhead protection areas within 4 miles of the Site. In addition, a release to groundwater of Site-attributable contaminants is not suspected.

Ref. 2, Figure 5; 18, pp. 1–2.

9. Identify one of the following resource uses of groundwater within 4 miles of the site (i.e., commercial livestock watering, ingredient in commercial food preparation, supply for commercial aquaculture, supply for major, or designated water recreation area, excluding drinking water use, irrigation (5-acre minimum) of commercial food or commercial forage crops, unusable).

There are no known aforementioned uses of groundwater within a 4-mile radius of the Site.

Ref. 18, pp. 1–2.

SURFACE WATER ROUTE

10. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence and relationship to background.

Although a release to surface water is not suspected, the analytical results of soil samples collected within the subject property indicate that concentrations of radionuclides are significantly higher when compared to concentrations documented at background locations. The contaminated area is located near a drainage ditch/depression and did not observe any storm drains.

Ref. 2, Figures 4 and 6; 4, pp. 6–22; 13, p. 1; 17, pp. 1–23; 24, pp. 1–2.

11. Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.

A release to surface water is not suspected due to the large, solid fragments of the waste material. WESTON visited the Site and determined that the Site is semi-paved and is mainly flat. The area of observed contamination is located in and near a drainage ditch/depression on the northern border of the property. It is likely that the majority of the runoff from the Site flows into this drainage ditch/depression, across Upper Mountain Road, into Fish Creek, and ultimately into the lower Niagara River.

Ref. 2, Figures 4 and 6; 4, p. 16–22; 24, pp. 1–2; 25, pp. 6, 7, 9; 26, pp. 4–5, 9; 32, pp. 1–3.

12. What is the distance in feet to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.

The area of observed contamination is located near the drainage ditch/depression that runs parallel to Upper Mountain Road. The nearest downslope surface water, Fish Creek, is located approximately 1,000 feet away as measured along the drainage ditch.

Ref. 2, Figures 4 and 6; 4, p. 14–22; 17, p. 1; 32, pp. 1–3.

13. Identify all surface water body types within 15 downstream miles.

Name	Water Body Type	Flow (cfs)	Salt/Fresh/Brackish
Fish Creek	Minimal stream	3.7	Fresh
Lower Niagara River	Very large river	>100,000	Fresh
Lake Ontario	Great Lake	N/A	Fresh

There is a suspected overland pathway to surface water; therefore, a 15-mile pathway map is provided. It is likely that the majority of runoff from the Site flows into the drainage ditch/depression located on the northern border of the property and then flows over Upper Mountain Road towards and into Fish Creek, then into the lower Niagara River and ultimately into Lake Ontario.

Ref. 2, Figure 5; 24, pp. 1–2; 19, p. 2; 25, pp. 6–9.

14. Determine the 2-yr, 24-hr rainfall (inches) for the site.

The 2-year, 24-hour rainfall for the Site is 2.5 inches.

Ref. 27, p. 5.

15. Determine size of the drainage area (acres) for sources at the site.

WESTON visited the site and determined that the site is semi-paved and is relatively flat. The subject property is approximately 10.2 acres. Due to limited soil and slag sampling, the actual size of the drainage area of observed soil is unknown, but is likely to be approximately equal to the subject property. The radioactive waste material was found at ground surface to a depth of approximately 8 inches below ground surface. It is likely that the majority of runoff from the Site is transported into the drainage ditch/depression located to the north of the Site, flow over Upper Mountain Road and then possibly into Fish Creek and ultimately to the Lower Niagara River.

Ref. 2, Figures 4; 4, p. 16–22; 12, p. 4, 6; 19, p. 2.

16. Describe the predominant soil group in the drainage area.

Surface soil samples collected during the December 2013 sampling event indicate that soil is predominantly comprised of various clays. Clay is considered to be moderately fine-textured with low infiltration rates and have an assigned hydraulic conductivity of 10^{-8} cm/s.

Ref. 2, Figures 4; 12, p. 6.

17. Determine the type of floodplain that the site is located within.

The Federal Emergency Management Agency (FEMA) has designated the site area to be within an area of minimal flood hazard, usually depicted on Flood Insurance Rate Maps (FIRMs) as above the 500-year floodplain level (i.e., the site is not located in a floodplain).

Ref. 15, pp. 1–3.

18. Identify drinking water intakes in surface waters within 15 miles downstream of the point of surface water entry. For each intake identify: the name of the surface water body in which the intake is located, the distance in miles from the point of surface water entry, population served, and stream flow at the intake location.

There are no drinking water intakes located within 15 miles of the probable point of entry (PPE) to surface water. There is one known drinking water intake in the surface waters surrounding the site vicinity. This surface water intake is controlled by the Niagara County Water District and is located on the West Branch of the Niagara River on Grand Island. It is located 10.5 miles upstream from the PPE and serves approximately 150,000 people through 108 service connections to towns and villages in Niagara, Erie, and Orleans Counties.

Ref. 2, Figure 4 and 6; 17, pp. 1–23; 19, p. 2.

19. Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each fishery specify the following information:

Although specific fisheries are unknown, NYSDOH and NYSDEC have issued Health Advice on eating sportfish and game in the western New York region, which include information on Fish Creek, Lower Niagara River, and Lake Ontario. NYSDOH states that "the general health advisory for sportfish is that people can eat up to four one-half pound meals a month of fish from New York State fresh waters…" with stricter rules for women who are or may become pregnant. Generally, all restrictions on eating fish are due to possible contamination of PCBs, Mirex, dioxin, or mercury and are not linked to any possible radioactive contamination from the Upper Mountain Road site.

Ref. 2, Figure 6; 19, p. 2; 20, pp. 1–21.

20. Identify surface water sensitive environments that exist within 15 miles of the point of surface water entry.

Environment	Water Body Type	Flow (cfs)	Distance from Site
HRS-eligible wetlands	Minimal stream	3.7	~750 feet
HRS-eligible wetlands	Very large river	>100,000	~1.25 miles
HRS-eligible wetlands	Great Lake	N/A	~9.25 miles

The HRS-eligible wetlands and the New York Natural Heritage Program information presented in the table above represent those closest to the site as measured to where they are along the 15-mile surface water pathway. There is a total of 475 feet, 261.4 feet, and 349.3 feet (all have a value of less than 0.1 miles) of wetland frontage acreage for Fish Creek, Lower Niagara River, and Lake Ontario, respectively. There are a total of 0.206 miles of HRS-eligible wetland frontage found along the 15-mile surface water pathway. According to the New York Natural Heritage Program, there are a total of 3 State-listed threatened species listed and 1 State-listed endangered species listed within 15 miles downstream from the PPE.
Ref. 2, Figure 6; 19, pp. 1–2; 29, pp. 8–10.

21. If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 18-20 that are or may be actually contaminated by hazardous substance(s) attributed to an observed release of from the site.

A release to surface water is neither observed nor suspected; see Question Number 10 for a description of the likelihood of release.

22. Identify whether the surface water is used for any of the following purposes, such as: irrigation (5 acre minimum) of commercial food or commercial forage crops, watering of commercial livestock, commercial food preparation, recreation, potential drinking water supply.

Surface water within 15 miles downstream of the site is used for recreation (e.g., boating, sightseeing, fishing, kayaking, etc.) and hydroelectric power producing purposes.

Ref. 16, pp. 1–2; 24, pp. 1–2.

SOIL EXPOSURE PATHWAY

23. Determine the number of people that occupy residences or attend school or day care on or within 200 feet of observed contamination.

There are no residences on and within 200 feet of observed contamination. The site is located within a residential area, and the land is currently vacant and not maintained by the property owner. There is a residence within 200 feet of observed contamination, which

utilizes the area of concern as a driveway; however, the residence is across a property line from the contaminated driveway.

Ref. 2, Figures 2, 3, and 4; 4, pp. 16–22; 31, pp. 1–2.

24. Determine the number of people that regularly work on or within 200 feet of observed contamination.

There are no employees working on and within 200 feet of soil contamination. The site is located within a residential area and the land is currently vacant.

Ref. 2, Figures 2, 3, and 4; 4, pp. 16–22; 31, pp. 1–2.

25. Identify terrestrial sensitive environments on or within 200 feet of observed contamination.

There are no terrestrial sensitive environments on or within 200 feet of observed contamination.

Ref. 2, Figures 4 and 5; 4, pp. 16–22; 29, pp. 1–10; 19, p. 1; 29, pp. 1–10; 31, pp. 1–2.

26. Identify whether there are any of the following resource uses, such as commercial agriculture, silviculture, livestock production or grazing within an area of observed or suspected soil contamination.

There are no known resource uses of soil within the area of observed or suspected soil contamination.

Ref. 2, Figures 4 and 5; 4, pp. 8–9; 31, pp. 1–2.

AIR PATHWAY

27. Describe the likelihood of release of hazardous substances to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them the site. For observed release, define the supporting analytical evidence and relationship to background.

A release of hazardous substances from the UMR site to air is not observed. WESTON personnel collected air monitoring data with RAD7 radon detectors on May 1 and 2, 2014. During the May 2014 air monitoring event, background radon concentrations were measured as 0.16 +/- 0.13 pCi/L (to account for maximum background concentrations, the uncertainty value is added to the background measurement for an adjusted concentration of 0.29 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.070 pCi/L (adjusted concentration is 0.12 pCi/L) during the afternoon hours on May 1, 2014. Background thoron concentrations were calculated to be 0.00 +/- 0.060 pCi/L (adjusted concentration is

0.060 pCi/L) during the morning hours on May 2, 2014 and 0.051 +/- 0.10 pCi/L (adjusted concentration is 0.15 pCi/L) during the afternoon hours on May 1, 2014. There were no radon or thoron concentrations that exceeded background radon or thoron concentration values; therefore, a release of hazardous substances from the UMR site to air is not observed.

Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11.

28. Determine populations that reside within 4 miles of the site.

Distance	Population
On-site	0
>0 - ¼ mi	138
>¼ - ½ mi	494
>½ - 1 mi	1,582
>1 - 2 mi	7,288
>2 - 3 mi	9,250
>3 - 4 mi	16,516

Ref. 21, pp. 1–2.

29. Identify sensitive environments, including wetlands and associated wetlands acreage, within 4 miles of the site.

Distance	Wetlands Acreage	Sensitive Environments
On-site	0	None identified.
0–0.25 mi.	4.93	None identified.
0.25–0.50 mi.	12.30	None identified.
0.50-1 mi.	22.14	None identified.
1-2 mi.	186.70	3 State-listed threatened species habitats
2-3 mi.	1,302.31	3 State-listed threatened and 1 endangered species habitats
3-4 mi.	1794.78	1 State-listed threatened and 4 endangered species habitats

Ref. 2, Figure 5; 19, p. 1; 29, pp. 1–10.

30. If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.

A release of hazardous substances from the UMR site to air is not observed. See Question 27 for a more detailed description.

Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11.

31. If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 29, that are or may be located within the area of air contamination from the release.

A release of hazardous substances from the UMR site to air is not observed. See Question 27 for a more detailed description.

Ref. 2, Figure 9; 4, pp. 14-19, 29-30; 34, pp. 2-5, 9, 11.

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